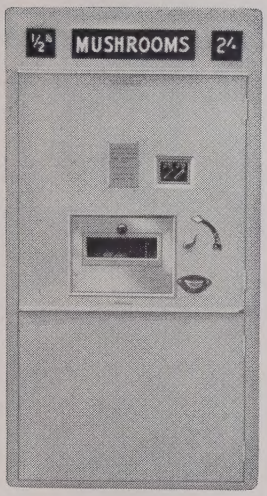
MONTHLY JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA BULLETIN

FEBRUARY 1961 · NUMBER 134

CONTENTS

AGM & ANNUAL LUNCHEON—22 MARCH



Buy an

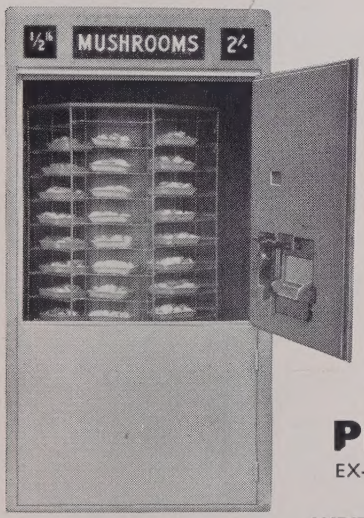
X-o-matic

VENDING MACHINE

A WEST SUSSEX GROWER INSTALLED AN **X—o—matic** VENDING MACHINE AT HIS GATE IN JULY THIS YEAR.

HE NOW REPORTS GROSS WEEKLY RECEIPTS OF MORE THAN—

£80



Done away with were—

Labour Problems

Wages

Transport

and

Marketing Charges

The average price charged was **4**/- per lb.

PRICE £98-10-0

EX-WORKS NON-ELECTRIC

WRITE FOR FURTHER PARTICULARS

NAME.....

ADDRESS .....

..... **X-o-matic Ltd. 52 Surrey Street, Littlehampton, Sussex**

SINDEN PROCESS GRAIN SPAWN

Manufactured by

E. HAUSER, CHAMPIGNON LABORATORIUM, GOSSAU — ZURICH

Sole distributor U.K., EIRE :

S. A. F. SAMPSON LTD., OVING, CHICHESTER

Telephone : Chichester 4455/6 *Telegrams :* SAMPSON, Chichester

SINDEN PROCESS GRAIN SPAWN

Manufacturer: E. Hauser, Champignon Laboratorium, Gossau-Zürich

The
MGA BULLETIN

FEB. - 1961
NUMBER 134

EDITORIAL

QUALITY COUNTS

Throughout the world of mushroom growing considerable attention is now being paid to the nitrogen content of composts with, one is forced to conclude, the sole object of increasing yields and so increasing profits.

Perhaps more than anything else N has been responsible for increased yields, not only in the field of horticulture but throughout the vast ramifications of the agricultural industry as a whole for in the latter sphere, N has resulted in vastly increased yields of grain, roots, straw and grass with, of course, increasing bulk fodder for cattle.

The introduction of the word " bulk " was deliberate for there is little evidence that the addition of N does anything to improve the quality of the produce and it is in this particular sphere that danger may lie ahead.

It is fashionable and profitable these days to produce this and that in record time, particularly " broilers " for instance, that type of small chicken which, forced to the somewhat prodigious weight of around 4½ to 5 lb. in about ten weeks, has, as an industry, forced itself into the foreground of the world of meat. But the " broiler ", in spite of what may be said to the contrary, is running into a load of trouble on the grounds that whilst the weight of meat is undoubtedly there, it lacks taste. Indeed, my own local political club in a Dinner-Dance invitation the other day, added its own voice to the general cry by announcing, on the invitation, that " an effort is being made this year to get away from the usual *tomato soup and chicken menu*". The substitute for chicken was announced as beef but in that the club could also run into trouble for, alas, so called " baby " beef is now being produced by similar methods to broilers, designed to turn out a beast of say 8 cwt., in just about half the time it takes under the old beef producing methods.

In chicken meat and in beef, intensive methods appear to be paying off, but on the grounds of quality, such methods could have a boomerang effect.

This then could be the danger, on our doorstep, in the mushroom production business, and the introduction of more and more N could lead to heavier production accompanied by a serious drop in quality. The mushroom owes its present splendid and constantly improving position in matters culinary, to its delicate and unequalled flavour. It would be a great pity if, in the struggle for heavier and heavier production, quality should be forfeited. It is right that experiments should be made with the addition of N but these experiments should be two-pronged (a) to find the optimum amount which can be added and result in increased yields and (b) only insofar as such increased yields do not result in a serious drop in quality. We must, at all costs, have a product which the housewife will buy time and time again.

WRA

GCRI OPEN DAY

It is announced that the Glasshouse Crops Research Institute Open Day this year will be on Thursday, May 25th, and it is hoped that as many growers as possible will attend. Further details will be announced later.

Calypso . . .

"THERE'S FOUR-AND-FIVEPENCE IN THAT"

Above a counter, quite concealed,
Our hidden camera has revealed
(At once exposed ere it is staler)
A conflict 'twixt consumer and retailer.
" Why, Mr. Grocer, can't you supply
A larger mushroom for the likes of I?"
" Oh, Madam dear, to be quite frank,
I buy the small because my bank
Would very soon begin to shout
About my loss from weighing out."
" But, Sir," says she " I love the large;
I'd gladly meet a higher charge
And though I'm shrewd I would not bounce
When you would charge the extra ounce."
Our candid camera thus exposes
This problem where a good solution poses—
A leaf be taken from butcher's book
Who when he cuts meat off the hook
Will weigh the joint, no eyelid bat,
But state " There's four-and-five in that."
Herein we solve (let all rejoice)
Retailer's Dilemma o'er Housewife's Choice.

F.P. (BELFAST).

MUSHROOM SCIENCE IV

Proceedings of the Fourth International Conference on Scientific Aspects of Mushroom Growing, held at the Royal Veterinary and Agricultural College, Copenhagen, 18th—25th July, 1959.

This volume, the fourth in the series giving the papers read at the International Mushroom Conferences, is by far the largest, with 572 pages. This fact, the wide range of countries (11) from which papers were received, and the care taken in editing papers in a language foreign to the author, account for the long time taken in preparing it for publication.

All the 57 papers read at the Conference are published in full, in the language in which they were given (English 42 papers, French 6, German 9), and all the papers in French and German have a summary in English. As a rough guide to the amount of material likely to interest growers, I have compiled the following classification of the subject matter of the papers:—

Purely academic interest		14
Mixed, research with some practical bearing		11
Practical:		
Compost	4	
Casing	3	
Growing conditions	7	
Diseases	5	
Pests	4	
Spawn and spawning	2	
Various	7	
	—	32
		—
		57
		==

(All readers might not agree with my opinion on this distribution, but it shows the general trend.)

Thus there is a very practical bias in the subject matter. The arrangement and printing are excellent, no small achievement in view of the complexity of some of the tables and figures. The papers are all clearly written, and all those likely to interest growers are quite easy to follow.

In my opinion no mushroom research worker or grower with any interest in progress can afford not to have this book. RLE

Mushroom Science IV is available from:—The International Commission on Mushroom Science, Champignon-Laboratoriet, Rolighedsvej 23, Copenhagen V, Denmark for Danish Kroner 70.00 plus postage, or from the Mushroom Growers' Association, Agriculture House, Knightsbridge, London, S.W.1, for £3 12s. 6d. including postage.


MON-LOUGH
REGISTERED
GRAIN SPAWN
FOR EARLIER CASING AND
QUICK HEAVY CROPS OF
GOOD-SIZED MUSHROOMS OUR
ACTIVE MYCELIAL SPAWN
(Made under new Scientific Process)
ENSURES BEST RESULTS
Dispatched promptly to
any address in
Great Britain and Ireland
SIX OF THE EIGHT CUPS AT THE
NATIONAL MUSHROOM SHOW
AT WESTON-SUPER-MARE
WERE WON BY GROWERS
WHO USE THIS SPAWN
Monlough Food Production Co. Ltd.
BALLYGOWAN - BELFAST
'Phone : Carryduff 243 'Grams : "Monlough, Belfast"

GROWING ON A SMALL FARM IN AUSTRALIA

6,000 sq. ft. Shelf Farm

Many mushroom growers dream about it but few accomplish it—growing successfully on a small farm for seven months of each year and holidaymaking for the remaining five months.

Yet that is exactly what Mr. D. McCord of Pendle Hill, New South Wales, Australia does, and he has been doing it for some years now.

Mr. McCord, a batchelor, decided a little over seven years ago to give up his work as an industrial chemist and concentrate on mushroom growing. One of the first things he did, after reaching that decision, was to visit England to see and learn as much as he could about mushroom growing.

Now, with his 6,000 sq. ft. housed in purpose built growing sheds using concrete blocks, asbestos and cement sheeting, steel and timber framed and aluminium foil, Mr. McCord, who recently called in the MGA office, finds little to really worry him.

Each of the six houses measures 40 ft. by 20 ft. by 9 ft. high and the three-inch cavity walls are filled with " caneite ", an insulating material made from sugar cane fibres.

The compost is synthetic, made on orthodox lines to the MRA formula, using dried blood which costs, in English money, about £36 per ton and straw between £10 and £11 per ton. After three or four turns, all by hand, Mr. McCord aims to fill a thousand foot house, to a bed depth of 8" for about £70 (£A90). That figure only takes care of the actual cost of materials and does not include labour, depreciation and so on.

He reckons to get the heap to heat up to 160° F. and hold it, with live steam, to 135° F. For every ton of dry straw an average of 750 lb. of mushrooms are produced. Peak heating lasts a week and there is a period of four weeks between filling and the first pick. Picking period extends for eight weeks or more and the average weight of the first flush is 1 lb. per sq. ft.

Production is geared to commence around mid-March and to finish at the end of September although, as Mr. McCord said, " Some growers do go on through October and November ". The mid-winter period is during June, July and August when the temperature drops to around 38° F. at night and rises to 65° F. during the day.

German peat, at £A3 a bale (£2 8s. 0d. sterling) is used with ground limestone for casing, four bales coping with 1,000 sq. ft. A quart of grain spawn suffices for 65 sq. ft. of bed.

With an average of 3 lb. per sq. ft. per crop Mr. McCord produces, in the seven months, 6 lb. per sq. ft. and two-thirds of his production goes to the canners at 3/3d. sterling per lb. in 15 lb. returnable containers collected at the farm, whilst the remaining one-third is dealt with on the fresh market, making an average of 3/5d. per lb. sterling.

One of the reasons for Mr. McCord's success and high profit margin is his labour force, which consists, in addition to himself, of two women casual workers picking three days a week and being paid about 5/- to 6/- per hour, and one man, a casual worker always on call and receiving 10/- an hour.

Disease control is maintained by steam and formalin in between crops and a small but efficient steam generator working up to 100 lb. per sq. inch pressure from cold in only five minutes.

To cope with the cold nights Mr. McCord has a novel system, comprising open water troughs running the length of the house and covered with polythene sheeting. During the day the water warms up and the system acts as an humidifier. " Of course it cools down in the night when the steam heating is off—I have pipes with holes running along the bottom of the troughs—but the hot water, with the polythene, takes a long time to cool and the houses remain reasonably warm during the cold nights and it takes only a little time in the morning to get the temperature back to 65° F." said Mr. McCord. "And that really works?" I queried. " It most certainly does " he replied.

Well, there you have it; just 6,000 sq. ft. of shelves in six houses, a comfortable living and five months holiday every year, a holiday which, for four or five years now, Mr. McCord has spent travelling.

What is his net profit a year? Well, he did tell me but without a closer look at the set up I'd better not say. WRA

MGA ANNUAL LUNCH AND ANNUAL MEETING

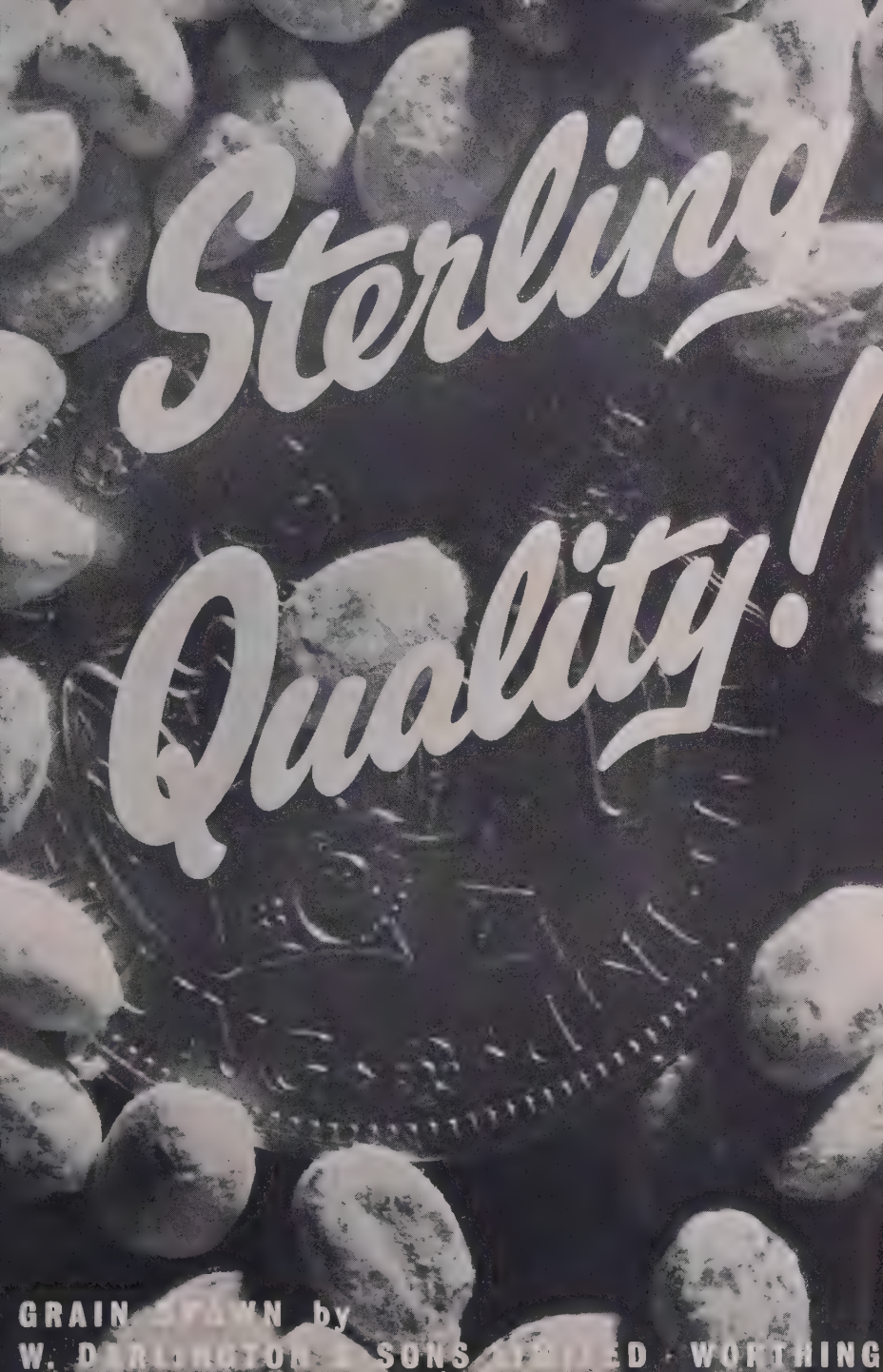
The MGA Annual Lunch and Annual General Meeting will take place on **Wednesday, 22nd March, at The Park Lane Hotel,** which is situated within easy walking distance of Hyde Park Corner.

As already announced, Lord Waldegrave, Parliamentary Secretary to the Ministry of Agriculture, will be the Guest of Honour.

Mr. P. B. Stanley-Evans, Chairman of the Association, will hold his reception, commencing at 11.30 a.m., and the luncheon, due to start at 12.30 p.m., will be followed by the Annual General Meeting at 2 p.m.

Luncheon tickets are available from the MGA Secretary at 32/6d. each and, in order to ensure the smooth running of the general arrangements, members are asked to make early application. Wives and friends of members will be cordially welcome at the luncheon.

The MGA Executive Committee regret the increase in the price of tickets but this is consequent on the change of venue and circumstances beyond the control of the committee. Please get your tickets right away from :— **The Secretary, Mushroom Growers' Association, Agriculture House, Knightsbridge, S.W.1.**


Sterling
Quality!
GRAIN
by
W. D
SONS
ED · WORTHING

HAVE YOU BOUGHT ANY?

Many thousands of the special point-of-sale publicity chip covers, sponsored by the MGA and sold to growers by Reed Corrugated Cases Ltd., are now beginning to make their appearance in greengrocery shops throughout the country and are playing their part in the ever increasing mushroom sales.

Provided sufficient quantities are ordered the covers may be had in any colour selected by the individual grower but the colour most popular is that originally selected by the MGA Publicity Committee and reproduced herewith.

The great majority of growers are now convinced that publicity is playing its part in increased sales and there is little doubt that these chip covers, available to growers at a highly competitive price, are themselves contributing to the general publicity effort.

The cover measures 12 ins. by 7 ins. and caters for the normal sized 2-3 lb. mushroom chip. The charges to members for **10,000 and over of these covers is 49/- per thousand and, for this quantity, the overprinting of growers names and addresses is carried out without extra charge.**

Prices for smaller quantities are :—

7,500	65/- per thousand
5,000	67/- per thousand
2,500	75/- per thousand
1,000	84/- per thousand

Carriage is paid on all orders of 500 upwards in England, Scotland and Wales and a surcharge of 5% is added for orders from N. Ireland, Eire and the Channel Islands.

These chip covers incorporate an excellent price ticket which are being increasingly used in shops to attract the eye of the housewife.

As the success of this initial effort at point-of-sale publicity is of vital importance to mushroom publicity as a whole, it is the hope of both the MGA Executive Committee and MGA Publicity Committee that growers everywhere will buy these covers in ever increasing quantities.

A full list of depots of Reed Corrugated Cases appeared on pp. 272 and 273 of *Bulletin No.* 127 (July 1960) but enquiries from anywhere may be directed to :— **Reed Corrugated Cases Ltd., Great West Road, Brentford, Middlesex. (Tel. 4123). The chip cover reference number is F/Q 0067/Z.**

Hey!—You know that practical trial we're giving to other forms of basic composting materials . . . . . ?

You can make better compost more quickly and reliably-with

ADCO 'M'

SPECIAL MUSHROOM COMPOST ACTIVATOR GIVES HIGHER FERMENTATION TEMPERATURES, AND A FIRST CLASS COMPOST THAT ASSISTS THE SPAWN RUN

MANY ADVANTAGES are gained by using Adco "M" as an activator in composting. Chief among them is the higher temperature attained both in the compost heap and in the beds during the peak heating process. Look at the results that follow from these higher temperatures.

First of all, fermentation goes ahead at a faster rate. Composting takes less time and the finished product is ready earlier.

Secondly, you have greater assurance that your crop will be free of pests and disease. The higher temperature either kills off the pests inside the heap or drives them to the surface, where they can be dealt with by insecticides. High temperatures during fermentation are particularly vital in preventing disease such as Vert-de-gris, of which there is special danger when composting during the winter months.

More nourishment

If you use Racing Stable manure, or other manure in which excess straw is present, the use of Adco "M" is strongly advised. The fermentation of this type of manure takes place more rapidly and effectively when Adco "M" is added. You get a more thorough breakdown of the strawy material, which then becomes available as food for the growing spawn. So your compost provides more nourishment for the mushrooms, and you get a bigger crop.

Better spawn run

Adco "M" produces a good quality compost of even texture. It provides an ideal medium for spawn run and helps to avoid greasy conditions, lack of aeration, and over wet compost – all of which delay mycelium growth. The spawn is able to make more rapid use of the food provided. It establishes itself more quickly and this is again a great help in preventing diseases and weed fungi. The faster the spawn grows and fills the compost the less likelihood is there of disease and weed fungi becoming serious competitors. A quick spawn growth also gives a quicker ultimate production.

You can have freedom from uncertainty in the composting process – by using Adco "M". It will pay you hands down. Adco "M" is specially formulated as a result of years of experiment, for the specific purpose of making mushroom compost. It can be used for composting with straw alone, if you wish. Or it can be used to compensate for variations in the quality and texture of your manure supply. Adco "M" provides the way to better mushroom compost every time.

Post this coupon for full details

Adco Limited, Harpenden, Herts

Please send me your leaflet giving full details of Adco "M".

NAME .....

ADDRESS .....

.....

HARVESTING PRACTICES

D. COOKE, M.A., and P. B. FLEGG, B.Sc., A.R.I.C.
Glasshouse Crops Research Institute, Littlehampton

Composting, watering and ventilation are rightly considered among the most important cultural operations of mushroom growing, but it is not always realised that the practices associated with harvesting can also have a considerable effect on yield, cash return, and the labour required during the picking period.

In the course of studies on the growth and development of the mushroom certain aspects of harvesting have been examined, and some results of practical value to growers have been obtained.

TRASHING

When picking mushrooms some stumps and associated dense masses of mycelium are inevitably left behind in the casing layer. A common practice described in growing manuals (Atkins, 1956; Ministry of Agriculture, Fisheries and Food, 1960) is to remove the stumps at frequent intervals and fill in the resulting holes with fresh casing material. This process is known as trashing, chogging, coring, stumping or stalking. The reasons put forward for trashing are that the stumps, if not removed, will attract pests and diseases, and that no further mushrooms will appear where the old stumps remain. On the other hand it is often pointed out that trashing frequently results in young pinheads being removed or damaged. With a short cropping period of about six weeks, picking is completed before any disease resulting from old stumps can do appreciable damage; also labour can be saved by omitting trashing. It is therefore of considerable practical value to discover whether trashing has a direct effect on yield.

Description of experiments

Three experiments have been carried out; one (P24) using 8 in. plant pots, and two (T4 and T7) using trays (2 × 3 sq. ft.). Half of the plots of each experiment were trashed at least once a week, old stumps and dead tissue were removed and all holes refilled with fresh peat and chalk. The other plots were not trashed at all throughout the cropping period. The cropping area in the pot experiment was small, forty-eight pots each of 50 sq. in. were used for each treatment, but in each of the tray experiments sixty-four trays were used making a total of 192 sq. ft. for each of the trashed and untrashed treatments.

Results

The cropping results are shown in Table I. In all three experiments there were no significant differences in total weight, number of mushrooms or average weight per mushroom, between the plots which were trashed regularly and those which were not trashed at all.

The method of picking at the G.C.R.I., chosen for experimental reasons, is to cut the mushrooms directly from the beds where the stalk

leaves the casing layer. This means that the plots which were not trashed had rather more stumps left after picking than would be the case if the twisting method of picking had been used. It was noticed during the experiments that most of the stumps shrivelled up, and after a few days were no longer visible. A few decayed with an unpleasant smell, but, in practice, the removal of a relatively small number of decomposing stumps would present no problem.

Normal control measures against pests and diseases were taken during the experiments, and although the cropping period in two of the experiments (P24 and T7) exceeded three months there was very little disease, and pests were readily controlled by regular spraying. The few instances of diseased mushrooms which were recorded occurred equally on trashed and untrashed plots.

By leaving the stumps on the bed, labour and casing material were saved, thereby reducing the cost of production; yields were not adversely affected, and pests and diseases were not especially troublesome.

STAGE OF PICKING

The second subject which has been investigated is the stage of maturity at which mushrooms are picked. A recent experiment at G.C.R.I. to determine the growth rate of mushrooms showed how rapidly individual mushrooms were increasing in weight at the normal stage of picking. It was found that at the button stage the mushrooms almost doubled their weight in a day; the weight doubled again in a further two days. The mushrooms continued to increase in weight until they had become very large flats (approximately the saucer stage defined later). It was therefore expected that the stage of picking would have a marked effect on yield.

Description of experiment

An experiment to examine the effect of the stage of maturity, at picking, on yield was begun in November, 1959. The following four stages of picking were defined:

(i) Buttons—mushrooms over $\frac{3}{4}$ in. diameter with the veil not broken,

(ii) Cups—mushrooms with the veil partially broken,

(iii) Flats—mushrooms with the veil broken, yet smaller than saucers,

(iv) Saucers—mushrooms with the cap curved upwards.

An attempt was made to pick at each of the defined stages. This was generally successful though mushrooms from both the Buttons and the Cups treatments included some which had reached a later stage of maturity since, even with daily picking, it was not always possible to pick all mushrooms at the desired stage.

Because of the method of picking, already described, used at the G.C.R.I., mushrooms at a late stage of maturity had very long stems

and needed to be trimmed before being marketed; so the actual yields recorded have been adjusted to give an estimate of the marketable yield. The following adjustments were made to the recorded yields:

(*a*) Buttons treatment — unchanged,
(*b*) Cups treatment — decreased by 10%,
(*c*) Flats treatment — decreased by 15%,
(*d*) Saucers treatment — decreased by 20%.

All results given are of marketable yield. The picking period was eleven weeks.

Results

A graph of the yields at weekly intervals is shown in Figure 1. The results for the Flats treatment are not presented in the graph, to aid clarity, but they were intermediate between those of the Cups and Saucers treatments. It will be seen that after four weeks the yields were in the order Saucers, Cups, Buttons, which they maintained for the remainder of the experiment. The yields after six and ten weeks are shown in Table II. In order to even out the effect of flushes, the yields quoted are the average of three weekly yields; the yields a week before and a week after are included in the average with the yield at the stated time. The relative differences between the weights picked from the treatments during the six to ten weeks picking period did not vary greatly, and on the average Buttons yielded 9% less than Cups, Flats 3% more and Saucers 5% more. These results agree with those of Edwards (1953) who used only three stages of picking (buttons, cups and flats). He also found that by twelve weeks the yields were equal, but with many growers picking for not more than ten weeks, it is the differences in yield that occur in this ten weeks of cropping that are important.

There was a large difference between the number of mushrooms obtained from each treatment. The number progressively decreased as the picking stage became later; the number obtained from the Buttons treatment was almost double that obtained from the Saucers treatment. Edwards (1953) found very little difference in numbers.

The treatments had a marked effect on the interval between flushes. For example, plots of the Saucers treatment were picked for the first time three days later than those of the Buttons treatment. With successive flushes the interval between the start of each flush, on plots of one treatment compared with those of the other, became greater. After ten weeks, seven flushes had been picked from plots of the Buttons treatment and only five from those of the Saucers treatment. Moreover the plots picked at a later stage gave fewer mushrooms in each flush than those picked at an earlier stage. These two effects combined to give a much smaller total of mushrooms, in a given time, from the plots picked at the later stages of maturity.

It is also interesting to note that the period needed to pick each flush from a plot decreased as the stage of picking was later (Table III).

Financial return

The average prices obtained at the G.C.R.I. for the various grades over a period covering that of the experiment are quoted in Table IV. The return, after ten weeks picking, from each treatment of the experiment was calculated and is given in the table. It will be seen that, at the average market prices obtained by the G.C.R.I., it is far more profitable to pick the crop as cups or flats than as buttons or saucers.

The results may be made of more general application by calculating, from the yields of each treatment, the prices that should be obtained for each grade in order to obtain the same financial return from each treatment. It will be assumed, for the purposes of the calculation, that the yield of each treatment consisted only of mushrooms at the defined stage for that treatment. The calculated prices, compared with that of cups are: buttons 10% more, flats 3% less and saucers 5% less. If the price obtained at G.C.R.I. for cups is used (3/3d. per pound) these values give the relative prices, per pound, for equal return to be: buttons 4d. more, flats 1d. less and saucers 2d. less.

The weights of stalks trimmed from mushrooms of the Cups, Flats and Saucers treatments have not been included in these calculations. Where there is a market for stalks, additional income may be obtained. The amount of stalk removed is of great importance in comparing these treatments and this is being further investigated.

The labour required for picking was also affected by the stage at which the mushrooms were picked. The later the stage at which a plot was picked, the less labour was required for picking. This was a result of the differences between treatments in number of mushrooms (Table II) and in the number of days taken to clear each flush (Table III).

CONCLUSIONS

(i) By not trashing, production costs were reduced without reducing yield.

(ii) The later the stage at which mushrooms were picked, the greater was the weight of the crop obtained, and the less was the labour required for picking.

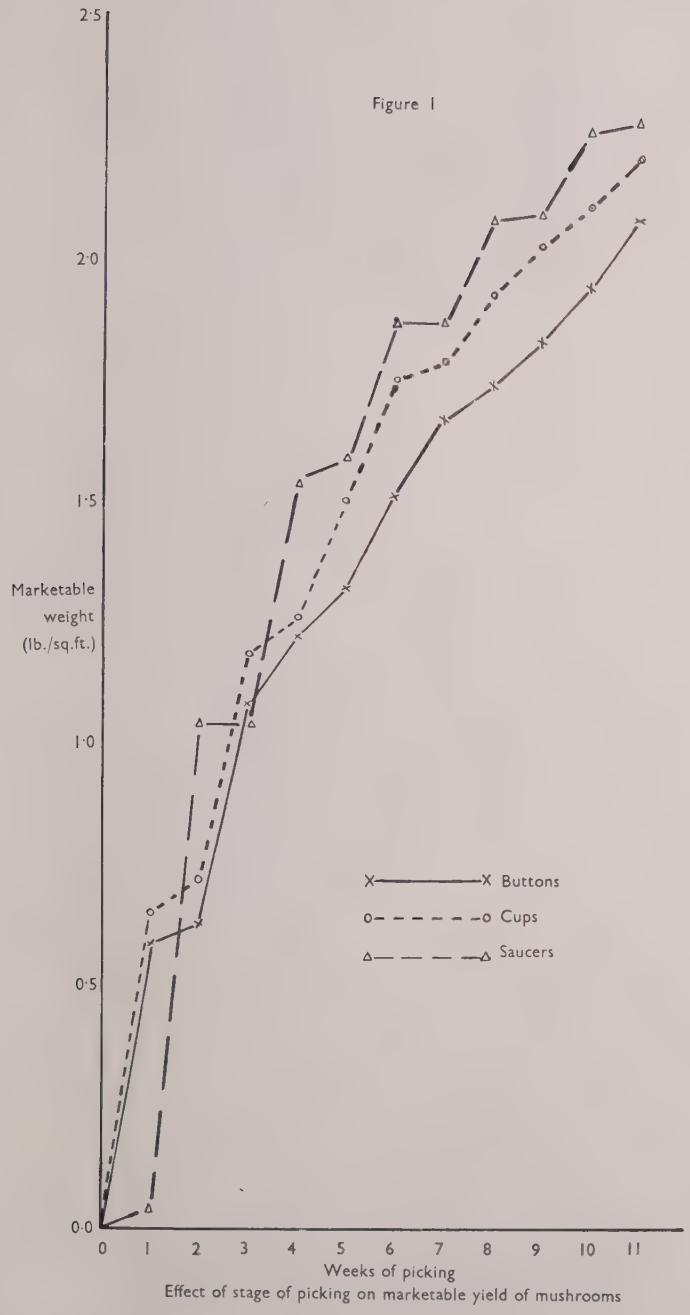
(iii) Choice of stage at which to pick for maximum return depended on the relative prices of the grades. At G.C.R.I. cups were found to be most, and buttons least, profitable.

References

Atkins, F. C. (1956). Mushroom Growing To-day. 3rd ed. London: Faber and Faber.

Edwards, R. L. (1953). A. R. Mushroom Res. Stat. 1952, 33-4.

Ministry of Agriculture, Fisheries and Food (1960). Mushroom Growing. Bulletin No. 34. London: H.M.S.O.



Effect of stage of picking on marketable yield of mushrooms

TABLE I

	Trashed	Untrashed	Standard error of difference
Experiment P24			
4 weeks picking			
Weight, lb. per sq. ft.	1.41	1.42	±0.132
Number per sq. ft.	64.5	69.2	±4.5
Average weight, oz. per mushroom	0.33	0.35	±0.013
8 weeks picking			
Weight, lb. per sq. ft.	2.09	2.13	±0.113
Number per sq. ft.	91.7	94.0	±6.0
Average weight, oz. per mushroom	0.36	0.36	±0.018
Experiment T4			
4 weeks picking			
Weight, lb. per sq. ft.	1.14	1.10	±0.040
Number per sq. ft.	39.5	39.2	±1.7
Average weight, oz. per mushroom	0.46	0.45	±0.018
6 weeks picking			
Weight, lb. per sq. ft.	1.46	1.40	±0.080
Number per sq. ft.	50.0	48.9	±3.0
Average weight, oz. per mushroom	0.42	0.46	±0.018
Experiment T7			
4 weeks picking			
Weight, lb. per sq. ft.	1.69	1.71	±0.058
Number per sq. ft.	55.3	55.4	±2.3
Average weight, oz. per mushroom	0.49	0.49	±0.021
8 weeks picking			
Weight, lb. per sq. ft.	2.28	2.27	±0.066
Number per sq. ft.	70.1	69.3	±2.9
Average weight, oz. per mushroom	0.52	0.53	±0.020

Comparison of yields from trashed and untrashed plots

TABLE II

	Buttons	Cups	Flats	Saucers	Standard error of difference
6 weeks picking					
Weight, lb. per sq. ft.	1.49	1.69	1.73	1.77	±0.073
Number per sq. ft.	78.5	66.8	56.0	41.7	±3.4
Average weight, oz. per mushroom	0.31	0.41	0.50	0.70	±0.024
10 weeks picking					
Weight, lb. per sq. ft.	1.96	2.12	2.19	2.21	±0.084
Number per sq. ft.	98.5	82.2	68.5	50.9	±3.7
Average weight, oz. per mushroom	0.32	0.42	0.51	0.71	±0.023

The yield after 6 and 10 weeks picking

TABLE III

Buttons	Cups	Flats	Saucers	Standard error of difference
6.0	5.7	4.5	3.1	±0.24

Period required to pick each flush, in days. The average value for the first five flushes has been taken

TABLE IV

	Buttons	Cups	Flats	Saucers
Weight, lb. per sq. ft.	1.96	2.12	2.19	2.21
Price obtained at G.C.R.I.	3/-d.	3/3d.	3/1d.	2/9d.
Return	5/11d.	6/11d.	6/9d.	6/1d.

Estimated financial return after 10 weeks

Mr. C. House: Do you add anything to the water when watering untrashed beds?

Mr. Flegg: No, and such beds received no special treatment. They were in the same house as the trashed, and treated exactly the same.

Mr. Gook: In costing in these experiments did you make any allowances for the different quantities of mushrooms marketed in the same size chip?

Mr. Flegg: No, but that factor did occur to me afterwards.

Mr. Atkinson: Did you have any special reason for cutting as opposed to picking in the normal way?

Mr. Flegg: We were afraid that, by twisting the mushrooms and trimming, our yields would vary according to the picker. Some might trim too close and others leave too much stalk. We were anxious to establish that any difference was due to the treatment and not the picker.

Mr. Figgis: Would not some of the stalk cores left become smelly and be a disadvantage on a commercial farm and were such cores easy to locate?

Mr. Flegg: My experience was that such cores were few and far between and quite easy to locate. We didn't pick for more than 12 weeks so I cannot say what might happen over a longer picking period. There was no evidence that the cores which did smell were any more numerous as the picking period lengthened—they occurred just during the cropping. In the experiment we rather expected that we would have beds littered with dead and decaying stalks, with and without smell. In actual fact the stalks and the clumps of stalks just shrivelled up and disappeared after turning black. Within about a week they were not visible. I would not therefore expect any particular difficulty with an extended picking period.

Mr. G. V. Allen: Most commercial producers would have difficulty in selling " umbrellas " in the normal market. Also, was any form of dust used in the experiment?

Mr. Flegg: I cannot remember just where our mushrooms were marketed and we are not suggesting that " umbrella " mushrooms should be marketed. We are suggesting that the stage at which you pick has an affect on the cash return. The "button" and "cup" comparison is of particular interest. We went on to " saucers " to see what would happen. As far as I can recall nothing by way of dust was used.

Dr. Storey: Was the loss of weight and the matter of keeping quality studied at all during these experiments?

ACTUAL RECORDS

IN LBS. PER SQUARE FOOT

ON MODERN TRAY FARM USING
STANDARD MANURE IN SAME HOUSE

2·47 1·57 2·33 2·20
2·08 2·55 1·91 2·36

AND THEN

3·33 3·04 3·21

WHEN A CHANGE WAS MADE TO

'ABUNDANCE No. 1'

No. 1 Suitable for Synthetic or Boosting
No. 3 An excellent additive for racing manure
No. 3 Specially blended to break down
SPECIAL MIX tough Cappelle Straw

WHY GAMBLE WITH YOUR COMPOSTS?

THIS SIGN IS YOUR GUARANTEE

BRADFORD FERTILIZER

CO. LTD.

BRADFORD, YORKS. Bradford 41288

MOUNT (Pure Culture)

IN 6 SELECTED STRAINS

To be sure of the best returns and lowest picking costs, it is essential to-day to spawn with a strain of certain **proved characteristics.** *These are*

★ **Good Size**

★ **Good Colour**

★ **Good Shape**

Consistent with sound commercial yields.

Sole Distributors :

J. E. R. SIMONS LTD. **HARLOW ESSEX**

Telephone HARLOW 222, 223 & 224

The CULVERWELL *Manure Turner*

MODELS FOR HAND or TRACTOR LOADING

ELECTRIC
PETROL
DIESEL

Our present range of three different models incorporates many years experience of manufacturing these specialised machines.

In use throughout the British Isles and many other countries.

Please send for details

E.O. CULVERWELL *Ltd.*

MALLING WORKS, LEWES, SUSSEX

Telephones: LEWES 637 (5 lines)

Mr. Flegg: No, we rather judged the matter on the basis of what the market was prepared to pay. If there had been any objections these would have been reflected in the price returned.

Dr. Edwards: Your Toddington experiments left no holes in the beds but left the cores. Did any new mushrooms develop round the old cores? Do you think the two methods of picking had any direct bearing on the problem?

Mr. Flegg: We did not specifically look for new mushrooms round old cores and I do not remember observing any myself.

Someone in the audience said that pinheads did, in fact, appear round the old cores.

Weston-Super-Mare, October, 1960

MUSHROOM FARM HEATING

by C. H. FAWCETT, A.M.I.E.E.
(Messrs. Burgess & Co. (Engineers) Ltd.)

At some stage in the development of his business the Mushroom Grower will be faced with the provision of a heating installation. The purpose of this paper is to afford some guidance to the Grower on the various alternatives open to him, and the factors which will influence his decisions.

Few industries can derive so much financial benefit from good thermal insulation in their buildings as the Mushroom Industry, and the importance of specifying the correct type of material for walls, roof, etc., can hardly be exaggerated. In the case of the Growing Houses the insulation reduces the heat loss in cold weather and hence saves fuel, while in hot weather it helps to maintain lower temperatures. The high room temperatures of the Spawn Running Houses and especially the Peak Heat Houses will cause great heat losses unless particular care is exercised. For example, the heat loss from a Peak Heat House will be three or four times as high as from a similar sized Growing House. A heat loss factor of 'U' equal to not more than 0.2 should be considered essential for Growing Houses and an even lower figure should be aimed for with the Peak Heat House. One simple and effective way of reducing the heat loss from a Peak Heat House is to arrange for a Spawn Running House to be erected on either side of it, with only a dividing wall between. This will reduce the loss through those walls by approximately half.

One of the principal decisions to be made is whether to use hot water or low pressure steam for the heating medium.

Hot water has the advantage that the pipe temperature can be varied over a very wide range –say 90°F to 150°F for large bore piping and 90°F to 170°F with small bore piping. Low pressure steam, on the other hand, provides " On-Off " heating where the pipes are at full heat or no heat The use of three heating pipes, or two unequally sized pipes, will permit three different levels of heating to suit weather conditions.

Twice as many small bore pipes are needed with hot water as with steam and while this may not be very important in a growing House, it results in an undesirably large number of hot water pipes for Spawn and Peak Heating Houses. It follows also, that if a unit type heater is used instead of piping, the hot water heater will be twice as large as the steam unit heater for the same output. Gilled piping may be employed in the Spawn Running and Peak Heat Houses but here again twice the heating surface is required with hot water.

The steam system has the merit of being able to increase both heat and humidity by the discharge of live steam into the Houses and indeed this practice of steam discharge has become an integral part of Peak Heating for a large proportion of Growers.

Steam heating has a lower thermal storage capacity than hot water and can therefore heat up, and cool down more quickly. With thermostatic control this characteristic results in a saving in fuel with steam over hot water. Steam can also be used for various sterilising purposes.

On very small installations a hot water system will be less expensive to instal than a steam installation, but an installation with, say, one Peak Heat, one Spawn and five Growing Houses will generally cost less in steam than hot water. The larger the installation the greater the financial advantage in using steam.

If a Grower decides that the heating of his Growing Houses should be by hot water, but that steam will also be required, it is not necessary or even desirable to have two separate boiler plants. The steam boiler can be used to provide both steam and also hot water. The water can be heated by means of a calorifier or by a steam injector such as the unit developed by the N.I.A.E., at Silsoe. Alternatively, a pressurised hot water system may be employed where the water of the boiler is circulated under pressure through the piping. With this system of heating a 3-way mixing valve and circulator are essential.

Because the pipe temperature can be as high as the pipe temperature with steam heating, only half as many pipes will be needed as with an ordinary low pressure hot water system. This equipment is seldom the cheapest, however, due to the cost of its control equipment.

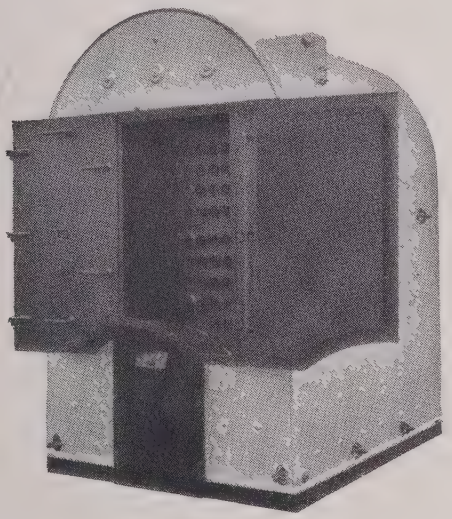
Thermostatic control should be considered essential with any of the heating systems.

The choice of boiler to be used will depend to some extent on the system selected. In the case of hot water boilers, the packaged boilers and oil-fired 3-pass steel boilers give the highest efficiencies but are most expensive ; the cast iron sectional boilers have a long and creditable record in the industry ; but generally it is difficult to ensure modern standards of efficiency with the cast iron tubular boilers, and for this reason they are not recommended. Where the steam system is employed there is a wide range of boilers available. The most efficient are the Economic or 3-pass horizontal boilers, and at the opposite end of the scale, the cross tube vertical boilers. These latter should only be used for intermittent sterilizing duties and not for continuous heating purposes.

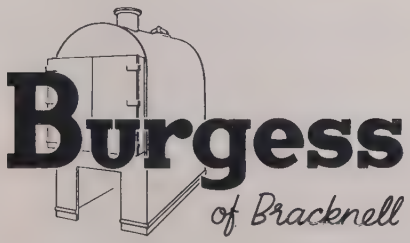
BURGESS BOILER FOR EIRE

BURGESS WERE SELECTED TO DESIGN AND INSTALL THE HEATING PLANT AT THE NEW EIRE HORTICULTURAL RESEARCH STATION AT KINSALEY, DUBLIN. This is the first Horticultural Research Station to be constructed in Eire and it will be among the finest in Europe, **and with the most advanced Mushroom Research Houses**

SPECIAL CREDIT ARRANGEMENTS CAN BE MADE TO SUIT CLIENTS' INDIVIDUAL REQUIREMENTS



One of the new 4 Million B.T.U. 55 PSI Steam Burgess Boilers ready for shipment to Dublin for installation at Kinsaley.



Boiler Makers
Acetylene and Electric Welders

Member of :
The Association of Heating and Ventilating Engineers, Electrical Contractors' Association

Makers of :
Burnell Forced Draught Equipment, Oil Storage Tanks, Calorifiers, Chimneys.
Horticultural and Industrial Steel Boilers. All Equipment for Glasshouse Heating, Mist Propagation Equipment.

BROXBOURNE HERTS.
Tel.: Hoddesdon 2305

LEITH EDINBURGH
Tel.: Leith 31056

BURGESS & Co. (Engineers) LTD.
BRACKNELL, BERKS.
Tel.: Bracknell 1341

Careful study should be made before selecting one of the compact and very efficient packaged boiler units for steam duty. These are not suitable for Mushroom Growing where there is 100% loss of condensate in certain processes, unless base exchange or lime soda water treatment equipment is installed. Even then, additional chemical dosage may be necessary.

Should the Grower decide to buy a secondhand or reconditioned steam boiler, the purchase should only be concluded after the boiler has been inspected and approved by an Insurance Engineer. Be very suspicious of any boiler, the working pressure of which has been reduced by the Insurance Company. The choice of boiler will depend on such factors as cost, availability, condition, method of firing, age, pressure, etc., but there is not normally any difficulty in obtaining a suitable Economic, Scotch Marine, or Cochran boiler. Generally, Insurance Engineers will be found most helpful in advising on the purchase of a secondhand boiler.

No omnibus decision can be given as to the most economic or suitable form of firing equipment for the boiler. Geographical location will have a large bearing on fuel price. Coal, for example, is cheapest in the coal producing counties such as Yorkshire, Lancashire, Leicestershire, etc., and is dearest where the transport charges are greatest. That is, on the South Coast, Channel Islands, etc. Oil, however, is cheapest at the main sea ports such as Southampton, London, Manchester, etc., where it is delivered and stored in bulk. Oil prices are adjusted according to delivery distance. There is an " inner " zone of about 30 miles radius around the principal ports which has the lowest price, then there is an " outer " zone extending about another 30 miles where the price of fuel is ½d. per gallon dearer. The remaining parts of the country, known as the " general " zone, are subject to a further ½d. per gallon because of the extra distance for freightage.

The choice between solid fuel and oil fuel, whether for a new installation or the conversion of an old plant, should be based on the type of boiler, i.e., whether suitable for both fuels or only for one, storage space available for fuel, importance of cleanliness, whether labour will be available at night times, week-ends, etc., as will be necessary with solid fuel, and finally, whether the cost of solid fuel and the associated labour charges is economically more attractive than oil fuel costs. A Consultant or any competent Heating Engineer can calculate the comparative costs of fuel to fuel, for any particular district, but the Grower himself must assess the labour he has, or would have, to expend for handling solid fuel, stoking, and removing ash, clinker, etc.

Hopper type anthracite firing high efficiency boilers may be used on small installations but where solid fuel is employed, the automatic firing device most commonly used for boilers up to 3,000,000 B.T.U's per hour is the screw-type underfeed stoker. This is a robust, reliable

machine, capable of quite high efficiencies of the order of 65%-70%, which will run unattended for periods up to, say, 10-12 hours. The stoker may be of the hopper or bunker pattern. In the former there is a hopper mounted above the screw of the stoker and this hopper is filled with the special fuel. The bunker stoker is normally fitted with two screws, the additional screw being an extension into a fuel store or bunker. There is appreciably less labour involved in using the bunker stoker.

If it is intended to run the stoker for 10-12 hours without attention, the boiler must have a large furnace which will give adequate " spillage " area around the stoker for the appreciable quantities of ash and clinker which will accumulate. Shell-type boilers, i.e. Economic and Scotch Marine boilers, are not suitable for use with these burners running unattended.

Care must be taken in the case of cast iron sectional boilers to select one with sufficient width to allow the requisite clearance between the stoker and the side of the boiler. Where boiler plants larger than 3,000,000 B.T.U's per hour, or, say, 3,000 lb. per hour evaporation, are being installed, consideration should be given to the use of chain grate stokers. The chain grate stoker is capable of burning more fuel per square foot of furnace than the underfeed stoker, will achieve an even higher efficiency and, not without importance, burns a fuel costing about 10/- per ton less than the fuel required for the underfeed type of stoker. Both of these firing devices comply with the Clean Air Act.

Oil fuel is supplied in a number of different grades, three of which are commonly employed in Mushroom Heating. These are diesel, 220 seconds, and 960 seconds oils. Diesel oil is a clear, thin oil, with which most people are familiar. It has a viscosity of about 35 seconds, i.e. a specified quantity will flow through a standard orifice, known as Redwood No. 1, in 35 seconds if the temperature of the fluid is 100° F. The second grade is a black, thick oil, and as its name implies, takes 220 seconds, or six times as long as the diesel oil, to flow through the same orifice. It must be heated to 140° F.—180° F. before it becomes thin enough to atomise satisfactorily for efficient combustion. The oil storage tank must also be fitted with an electric heater at the outflow point to keep the oil at about 45°F, for at lower temperatures, the oil thickens to such an extent that the burner is likely to be starved of oil. The third grade of oil, known as 960 seconds, is a black oil which as its number indicates, is still more viscous. It requires more heating in the oil storage tank, larger diameter supply lines which must be heated and insulated, and a higher temperature, about 170°—210° F. for satisfactory atomisation. The equipment is therefore more complex and more expensive to install, and the electrical running costs are greater, but the oil fuel cost is lower.

Diesel oil, which is the simplest, cleanest and most suitable oil to use, is unfortunately the most expensive to buy, because it is the most refined. It is normally only employed on boilers up to 400,000

B.T.U's per hour. 220 seconds fuel is used for boilers between 400,000 B.T.U's per hour and 1,000,000 B.T.U's per hour, and 960 seconds from 1,000,000 B.T.U's per hour to 4,000,000 B.T.U's per hour. If the installation has boilers in excess of 4,000,000 B.T.U's per hour, however, consideration should be given to an even heavier grade of oil known as " Bunker " or 3,500 seconds fuel oil.

There are several types of oil burner from which the Grower may choose but for boiler ratings up to 3,000,000 B.T.U's per hour by far the most commonly fitted burner is the fully automatic pressure jet oil burner. This type of unit fires at a constant rate according to the size of the jet or atomiser fitted, and the pressure on the oil, but it will switch itself on and off as necessary to meet the variations in the boiler load. It is provided with a high voltage continuous spark when starting up, to ignite the oil, and it incorporates safety devices to switch itself off if the flame is not established. The electric heater when necessary is built into the unit. This type of burner is capable of achieving a combustion efficiency of 70%—85% depending on the type of boiler to which it is fitted and the care exercised in setting the controls for air, oil, etc. . . It should be clearly understood, however, that an oil burner, like an automatic coal stoker, will only give efficient combustion if all its controls are properly adjusted. The efficiency of firing can readily be checked by means of a portable testing equipment, the cost of which is under £50, and many more Growers could and should use this testing apparatus to prove that they are burning their fuel as economically as possible. The cost of the equipment could be recovered several times a year by a great many Growers, from the fuel saving resulting from its use.

For the larger Mushroom installations using oil fuel, the economics of rotary cup and other types of burners capable of using bunker oil, should be investigated. All of the oil burners referred to above are capable of complying fully with the Clean Air Act.

Mr. A. J. Berry: Should regular efficiency tests be carried out on oil-firing equipment?

Mr. Fawcett: Yes, without question. I would say that oil burners are subject, generally, to much less variation in efficiency than coal-fired. One of the principle merits of oil-firing equipment is that it is stable. Your fuel is consistent and your conditions shouldn't change very much. I always advocate testing because I think it is in the interests of the grower. One wouldn't however expect any great variations in an oil burner over a period of two or three weeks unless the controls had been altered. With coal firing the variation, even overnight, could be over quite wide ranges. I have taken a test right through the night on a coal fired installation where we started off with a combustion efficiency on an under-fed stoker of about 76%, which is high. The boiler was too narrow for the grate and by 3 o'clock in the morning the build-up of ash and clinker was choking the firebed and the efficiency dropped to 63%. At that point I abandoned the test—by 8 a.m. the efficiency would obviously have been much lower.

SMALL ADVERTISEMENTS

Cont. on page 88

PURPOSE BUILT mushroom farm (managed) extending to 2¾ acres. Outskirts of important home counties town, offering excellent local market and direct rail communication London, Birmingham, Bristol, Southampton. Buildings easily adapted for poultry or rabbits. First class detached residence. Price Freehold £11,000. Would sell without residence. Apply: NICHOLAS, 1 Station Road, Reading. (Tel. Reading 54055).

JACKSON & LAKIN LTD., (Est. 1875) Wholesale Market, Nottingham, wish to contact Mushroom Growers, capable of loading daily.

HI-LITE translucent sheets, lightweight and fire-resistant, match other corrugated sheets to admit light to farm buildings. COOPERS, Builders' Merchants, Ashford, Kent.

EVANS MULTI POINT THERMOMETER, scale 50° F. to 200° F. with three leads. Offers wanted. ANDREWS & FROST LTD., Southdownview Road, Worthing, Sussex. Tel. Worthing 1519.

FOR SALE. Gravity Conveyors, Rollers 18″ and 14″ wide with Stands and Curves, some unused. Quantity 4″ C.I. Hotwater Piping, Fittings and Valves, etc. Reconditioned Steam and Hotwater Boilers. A. H. Kimmins & Sons, Ltd., Lyndhurst Road, Worthing.

RUSSELL ST.
CHAMBERS

BINGLEY
YORKS.

Tel. BINGLEY 4383

SOLE DISTRIBUTORS FOR

PINKERTONS PROLIFIC PURE CULTURE SPAWN

GRAIN OR MANURE EXCELLENT DELIVERY

TARPEN HOE TILLER for "shake up" spawning

"ACRE" SOIL SHREDDER for casing mixing

RE-DESIGNED HUMIDIFIER for correct moisture content

PEPSAN for cleanliness

POLYZOTE and **SISALATION** for insulation

All these products help to obtain good crops and all are available from

NORTHERN HORTICULTURAL SUPPLIES

Dr. Storey: Do you think that, at the present time, insufficient attention is being paid to heating mushroom houses via hot air through existing ventilating systems?

Mr. Fawcett: That is a very good point and I am not too sure how to answer. If a start was made with a peak-heat house I would say that something could and probably should be done even now. There is an increasing use of air systems in order to even conditions throughout. I would say right away that there must be a differentiation between re-circulation and incoming fresh air. If we are to think in terms of putting a heater into a re-circulating system then that heater would only need to be the same size in heat output as the existing piping system. If however, the problem concerns the incoming fresh air then, in a peak-heat house for instance, the heating load would have to be increased by a factor of at least two to one. At the moment, perhaps the only forseeable objection to incorporating the heating into the re-circulation system was that the re-circulation might not ensure equal heat distribution overall. Piping did that. It was just a question of proper and efficient design.

Replying to **Mr. Robertson, Mr. Fawcett** said that insurance companies did not insist on constant attention to boilers using solid fuel. Recently the companies published new regulations specifying safety devices on a steam boiler left unattended. They made no difference between an oil or solid fuel boiler provided each was an automatic plant.

Dr. Chapman asked if automatic humidification of mushroom plants was possible and **Mr. Fawcett** said that technically it certainly was and that his firm (Burgess) was already engaged in such research. Provided the price was right he certainly felt that mushroom farms would have such humidification installations. Perhaps, by the time the next conference came round, he would be able to answer that question more fully.

Weston-Super-Mare, October, 1960.

PROBLEMS FACING A SMALL GROWER

Norman R. Cooper

When one is asked to present a paper at a conference it is never wise to enquire why, anymore than I dare ask myself what prompted me to accept. However I take courage in the fact that I make my debut, not as the star, but as one of the supporting cast, and for a while, we are to consider the various problems that beset the small grower.

Whilst I do not wish to direct my remarks solely to the very small, since the problems of growers of all sizes must, obviously, be very much the same, nevertheless a quick answer to any problem is, I suggest, more vital to the small grower since his financial reserves will also be small. And yet his own experience may well be insufficient to provide a ready answer. But first what are the problems? They are widespread and include plant construction, mechanisation, availability of labour, and cultural problems.

Let us deal with the first three together, for plant construction is dependent on the amount of mechanisation visualised, which in its turn depends on the total labour force employed.

Many small growers have started with one house and have developed from this or are growing mushrooms in greenhouses etc., as a catch crop but I am quite sure that the future will show, as the present is showing, that the purpose built plant is the only economic way. Since I am a tray grower I speak mainly from a tray grower's point of view and here the main problem is that of handling the trays. That they have to be handled is inevitable, even on large plants, and the small grower with only, perhaps, himself and one or two others, at most, must be governed by the size of labour force when considering the form of mechanisation. It would be useless for him, for example, to use roller conveyors if his labour force is insufficient for the system to be manned at both ends at once. Great distances must not be covered in moving the trays from one point to another as this is wasteful in time and energy. His plant, therefore, should be so constructed that all movement is reduced to a minimum. His heat room can have doors leading direct from the compost shed and his spawn running rooms, soil shed and growing sheds following on. Indeed there is no reason why the whole plant from the heat room onwards should not be covered in, thus making for ease of operation in all weathers.

Tray sizes must also be governed by labour force and here again the small fish tray seems ideal. They are easily palletised for moving by inexpensive hand lifting trolley. Door sizes, height of rooms, etc, must all be considered in light of equipment and labour force.

Much has been written on matters of insulation and ventilation and I do not propose to discuss the problem in detail here. It must be remembered, however, that most insulating materials are only satisfactory if kept dry and the insulation properties of any building that is not vapour proofed will suffer.

The heat rooms, because of the high internal temperatures and humidity, are, particularly vulnerable. In considering roof design it is important to bear in mind that it is only against atmospheric temperature that one needs to insulate. In the summer, on a sunny day, the surface temperature of a roof will rise 50 or 60 degrees above the surrounding air temperature and yet one sees insulation being placed directly on these surfaces. There must obviously be an air gap between roof and ceiling and the insulation placed on the ceiling leaving the roof to take care of the heat of the sun.

On ventilation this subject was dealt with at length by Figgis at Southport. The use of polythene tubing certainly makes air distribution a much easier, cheaper matter and provided proper attention has been paid to the reduction of heat and moisture losses the whole problem of ventilation becomes less complex.

On cultural problems, the grower, particularly the tray grower during the past ten years, has only himself to blame for the many, seemingly obscure, troubles that have beset him. The basic aim of growers and, presumably, of spawn manufacturers is to obtain an increase in yield measured in pounds per square foot or at any rate the same yield in a shorter time and it is in attempting to do this that the troubles begin. My records show that, when I took the first steps along the dangerous path of the mushroom grower, some ten years ago, my first crops, on trays, averaged almost 2 lbs. per square foot in a cropping period of twelve weeks. It is not unusual for growers to begin so well and why is it that we cannot maintain the standard? In those days my heating was by electric tubes, my only ventilation system one seven inch exhaust fan giving two to three changes per hour. My houses of 4,000 cubic feet held 1,200 sq. ft. of trays and my heat room only half this size in which the trays were close stacked with scarcely one inch between them. An eight inch aerofoil fan placed on the floor did its best to circulate the air and fresh air was admitted whenever we opened the door to check the temperature. Not, you may well conclude, a brilliant set-up so why did I manage to produce so well?

Firstly I believe because the compost was made in 28 days—the normal thing post war, which meant that it was virtually ready to produce even before peak heat. The heat room therefore, became relatively unimportant merely acting as a means of disease and insect kill. The growing conditions, too, had no need to be so exacting as the first flush was rarely more than a third of a pound, and with this slower rate of production the ventilation problem was not so acute. In those days one looked forward to a steady period of growing with the first three or four flushes of about the same weight.

Nowadays, in an effort to move with the times, we are told that we are over composting if we spend more than ten days outside. It is nonsense, of course, as our own experience tells us but we listen or read and so we take our first steps into the abyss. Since we are told that we can no longer assess the compost by appearance we take no notice whatever when commonsense tells us that the evil smelling mess we have made, at the first attempt, is wrong. No, we fill the trays, carefully ramming the wet mess in as hard as a board and proceed to fill the same heat room that has given such good results in the past. It is hardly surprising that cropping becomes inconsistent and, in our dilemma, we begin to wonder whether the moon does, in fact, play a major role in the game. Before very long we realise that our knowledge of mushroom diseases cannot cope with the ever increasing variety of moulds that now occur and we study white plaster, brown plaster, coprinus, myceliophthora and others in ever increasing quantity.

Even the mushrooms themselves no longer grow normally but begin to tilt this way, and that, to turn grey and die off. The names La France, Watery Stipe and brown disease are given to these sypmtoms, and whilst I do not, for one moment, suggest that these diseases are mere figments of the imagination I do feel that, as diseases, they have yet to be proved and in the majority of cases where these characteristics are present the answer lies elsewhere than in disease.

In my own case and many of you know that for some two years all the characteristics of La France were present in every crop, reducing yields to negligible amounts, all efforts to control the trouble, as a disease, failed. But as soon as the problem was tackled as a cultural one I was able to overcome it though it was not at all easy to find the fault.

One is constantly asked how much of our problems is the fault of the spawn. I would say very little but there seems little doubt that the more vigorous the spawn strain the more sensitive to environment it becomes. During the years when I was tackling the problem of La France I experimented with all types of spawn and the results were these :—

1. White strains, of all manufacturers I tried, were susceptible.
2. Biscuit coloured strains became affected only in the latter stages of the cropping period and the spread of the " disease " was only very slow.
3. Brown strains were unaffected.

As I have said before this particular problem was resolved by modifying my growing technique, especially in matters of aeration, and it was with dismay that in April of this year a crop of Biscuit coloured mushrooms began to die off in the second flush and failed completely in the third. I naturally thought that my old friend " La France " had returned in spite of all I had done as subsequent crops of tinted mushrooms died off as well. A crop of white mushrooms, however, was completely unaffected and a crop of a mixture of both white and tinted mushrooms growing in the same trays produced normally for two flushes after which the tinted mushrooms died off at various stages of the third break and the white continued normally to the end of the crop.

It was decided, therefore, to call this problem " Mummy " disease and as Rasmussen so rightly pointed out at Southport Mummy disease appears to be specific to various strains and with me the cure was to grow only white for a time. After a short period the biscuit coloured variety could again be grown quite unaffected by Mummy.

So each of us both large and small has been faced with a score of problems over the years some of which are easy to solve and some of which defeat us but I have yet to come across any problem that has no answer.

One side-effect of " La France " or Watery stipe was the secondary break down of the mushroom by slime forming bacteria. In fact I originally tackled the problem as a bacterial one. Sodium Hypochlorite did little to relieve the matter but I did, after many trials, establish complete control by the use of Quaternary Ammonium Compounds. It is strange that so little is known about these salts by the grower. One of these products is sold commercially and very cheaply and since it has so many properties that the grower could use I am surprised that its use is so slight. Its efficiency in preventing bacterial blotch and spot and water staining of the cap, which is caused by

bacterial action, is complete in my own case and it is heart breaking to think that this and, no doubt, other substances pass by unnoticed by researchers who are apparently quite uninterested in the immediate welfare of the mushroom grower.

The small grower particularly must find his own way out of the maze of problems that occur. It is true that he may call upon the services of the N.A.A.S. to assist him and whilst this service applies itself with energy to any task its experience is bound to be limited. But I cannot speak too highly of the efforts made by that organisation, particularly Dr. Storey of Shardlow Hall, to assist me at all times and it is only through the growers themselves that the N.A.A.S. can hope to build up a complete picture of problems which could then be used to benefit us all.

And now a word, as I approach the end, about the present tendency on the tray farm, to reduce the area of square footage per house to that of a bed house and at the same time to stack the trays in exactly the same way for peak heating as for growing. Although, if this process is taken much further, there will soon be no point in considering the tray method at all, I am informed that production per square foot can this way be increased. You do not require me to tell you how many unhappy hours can be whiled away in working out what increase in pounds per square foot must be achieved to compensate for the loss of tray area per house, what saving in materials if any. Will picking costs be lower? What extra capital costs will be involved? Will an increase in yield be obtained by putting in only half the number of trays per house leaving the air space between trays the same or must that space be increased to that of beds? The problems arising from one single observation can be many and I would have to be much surer than I am at present that a reduction in my tray area per house would lead to greater financial return, since to increase yield measured solely in pounds per square foot does not necessarily increase the profit.

The future, for the small grower, is still as bright as it ever was but, nowadays, it is only the efficient who can expect to do well. But no one should imagine that he can, always, "go it alone", and co-operation in publicity, purchasing, and growing can only make the road ahead an easier one for all.

Dr. Edwards: Which of the Quaternary Ammonium Compounds do you use and how do you use it? Can you say anything about its stability and is there any residue on the mushrooms or the trays?

Mr. Cooper: The particular QAC used is sold by ICI under the name of "Vantoc AL". The cost is something in the region of 2/6d. per lb. and the recommended dosage is ¼ oz. per gallon. I did not have any success against bacterial disease when I sprayed the casing material with the solution. My final method was to impregnate the peat with the solution by applying it to the water in which the peat was soaked.

From then to the pinhead stage all watering was with this solution and the interior of the growing houses were also sprayed. This did establish control although not immediately. The danger appears that since this compound is very soluble (it is liquid and disappears very rapidly) the use of pure water appears to wash the QAC away from the surface of the casing material where its retention could be quite important. This QAC is completely positive and doesn't change —it is completely stable. It is important that it should be present throughout the crop. It cannot, however, be applied to the mushroom direct as it does stain the cap. Therefore, immediately the mushrooms appear it cannot be used. I found that using it up to that point established control. There appeared to be no residual effects and the cropping potential remained unaffected.

Mr. R. Thompson: Is " bubble " controlled in any way?

Mr. Cooper: None whatever.

Dr. Chapman: Was the peat sterilized before or after?

Mr. Cooper: There was no sterilization at all. Most growers put the peat bales in a tank of water where they soak for 48 hours. In my case the peat was put into a solution of Vantoc.

Mr. P. B. Stanley-Evans: In your rather summary dismissal of short composting under modern conditions, where do you evaluate the saving of material and, therefore, the economic advantage which it undoubtedly produces?

Mr. Cooper: In spite of all I have said I do, of course, use short composting methods and only take about eight days. I did say that, at first, my short composting was always a dismal failure. There is a tremendous saving in material and therefore money and there are some dangers. To my mind the main danger is not in the method but in the material one has to handle. Most of us have suffered from Capelle-type straw and, under normal conditions, this doesn't seem very suitable for short composting. It holds too much water but this has to be overcome. I find that provided you allow the material at no stage to become anaerobic, whatever it may look like when it goes into the heat room; and provided your heat room is working efficiently, this type of straw can be dealt with and made to produce a satisfactory crop. The danger seems that Capelle straw tends, in some curious way, to become anaerobic. It doesn't necessarily smell but it seems to be lacking in air. But it can be handled and I would suggest that, as a future development, all material will have to be composted off the ground so that there is no danger whatever of anaerobic fermentation.

In reply to a question from **Mr. Segboer** (Holland), **Mr. Cooper** said that the Vantoc, although sold by the lb., was a liquid and could not. therefore, be applied as a dust.

HORTICULTURE PROMISED FULL SUPPORT

NFU ANNUAL MEETING

At the Annual General Meeting of the National Farmers' Union in London last month, at which Mr. Harold Woolley was unanimously re-elected President, full support to horticulture was promised by Mr. Eric Gardner, Chairman of the NFU Central Horticultural Committee.

Two resolutions on horticulture were accepted (1) viewing with dismay the continued decline of the horticultural industry and urging the NFU to take vigorous action to force Government action and (2) welcoming the NFU Central Horticultural Committee's proposed complete investigation into the horticultural industry as a whole and urging action by both the industry and Government to arrest the alarming decline in growers' incomes.

Summing up the debate prior to the passing of both resolutions Mr. Gardener said the Horticultural Policy Committee were going to look into everything; support payments, acreage limitations, minimum prices, imports and the rest. He said that whilst excessive imports were responsible for part of their problems, they were not responsible for all. It did not apply very much to main crop vegetable growers, because if there was an acreage of 260,000 there was almost certain to be a loss, but with 250,000 acres, they could say there would be a profit.

AGRICULTURAL CHEMICALS APPROVAL SCHEME

Over 400 Approved Products Listed

In London, on 1st February, at a special Press conference, Mr. Vane, Joint Parliamentary Secretary to the Ministry of Agriculture launched the new Agricultural Chemicals Approval Scheme which lists over 400 approved insecticides, fungicides, herbicides, seed dressings, etc., and not only outlines the precautions which should be taken by the users when applying the chemicals, but also gives the minimum interval which should elapse between the last application and the harvesting of fruit, vegetables, etc., for human consumption.

The booklet, an extremely useful guide to all users, may be had from:—The Ministry of Agriculture, Fisheries & Food (Publications), Ruskin Avenue, Kew, Surrey, free of charge.

DID YOU KNOW?

The Manchester Evening News of 25th January, under the heading of "A Growing Industry" said: "Mushroom culture is now being undertaken in the new territories of Hong Kong and is proving itself a small but steady industry. About four acres of land are devoted to it. The annual crop is worth about £15,625. Most of the crop is eaten locally, but some is canned and dried for export."

MGA EXECUTIVE

General Seat Nominations Required

Nominations are required for the two General Seats on the MGA Executive Committee. Any U.K. Grower Member of the Association may nominate any other U.K. Grower Member and those members nominating are asked to make sure, as far as possible, that the member nominated is willing to stand. **Mr. E. A. Gook** (Kent) and **Mr. Raymond Thompson** (Sussex) are the retiring General Seat members and only Mr. Thompson is eligible for re-election, Mr. Gook having completed six years on the Executive. Mr. Thompson is willing to stand for election for a further period of three years.

Nominations for these two seats should be made, by letter to the MGA Secretary and must be received on or before **Wednesday, 1st March, 1961.**

In the event of more than two candidates being nominated, voting papers will be sent to all U.K. Grower Members on or before 8th March next and these must be returned to the MGA Secretary, Agriculture House, Knightsbridge, London, S.W.1, **on or before Friday, 17th March.** The votes will be counted at the Annual General Meeting on Wednesday, 22nd March, and the result will be announced immediately.

AREA SEATS ON MGA EXECUTIVE COMMITTEE

Contest in Area C only

There was a contest in only one of the three areas concerned with Area Seat representation on the MGA Executive Committee this year.

The contest was in Area C (Buckingham, Bedford, Oxford, Northants, Warwicks, Lincoln, Nottingham, Leicester, Derby, Rutland, Stafford and Huntingdon) where a former member of the MGA Executive, Mr. N. R. Cooper of Kimcote, Rugby, was opposed by a Nottingham solicitor, Mr. P. K. L. Danks, who has 20,000 sq. ft. farms in Wiltshire and in Wales. Mr. Cooper's tray system farm is one of 15,000 sq. ft.

Voting took place earlier this month and all ballot papers were due to be received at the MGA office by Tuesday, 14th February. The result will be announced in the March *Bulletin.*

Only Grower Members within the Area concerned were eligible to vote in this Area Election.

FANCY THAT!

Under the heading of "Mushrooms are popular in the North" the *Yorkshire Evening Post* of 23rd January said: "Consumption generally has risen considerably in the last few years and farms of *over 1,000 acres* are by no means uncommon."

NAMES OF NON MEMBERS REQUIRED

Although the share of the mushroom production market from non MGA members is estimated at only between 10% and 15% of the total, an effort is being made to attract these producers into the MGA and the MGA Secretary will be very glad if members, who know of non-member producers, will let him have the names and addresses so that contact can be made.

Presentation of portraits of Lord and Lady Netherthorpe, which were donated by members of the National Farmers' Union was made by Mr. Harold Woolley, President of the N. F. U., at a ceremony at Agriculture House, Knightsbridge. Lord Netherthorpe was President of the N.F.U. from 1945-1960. The portraits were painted by Henry Carr, A.R.A. Lord and Lady Netherthorpe admire the portrait of Lord Netherthorpe, with Mr. Harold Woolley (centre).

SMALL ADVERTISEMENTS 4d. a word *(Cont. from p. 73)*

PURE DRIED GROUND POULTRY MANURE. This pure, natural organic is regularly used by prominent mushroom growing firms. It represents an invaluable *organic* activator for stable manure. Finely and evenly ground, it is convenient and clean to handle and being packed in ½ cwt. sacks, the weight you receive is *guaranteed.* Sample and prices (which vary according to the distance for carriage from our Works) on application. Sole Producers:—THE HAMPSHIRE GUANO CO. LTD., SOBERTON, SOUTHAMPTON. (Est. 1937.) Manufacturers of " Gunos " (Regd.) Brand Fertilisers.

CHALK AND CARBONATE OF LIME. Best quality Ground Chalk and Derbyshire Limestone supplied in bags; also broken chalk and limestone. DERBYSHIRE STONE LIMITED, Matlock. Telephone: 741.

REGULAR SUPPLIES of graded mushrooms required. Please write for Managing director to call. WRAY & PEASE LTD., Castlefolds Market, Sheffield 1.

NOTTINGHAM Company require mushrooms urgently. Write for managing director to visit you. Box No. 5.

MUSHROOM TRAYS. We have regular supplies of Danish and Norwegian fish trays for all your requirements. Please contact J. G. RODGERS, 4 Salisbury Row, London, S.E. 17. Telephone: Rodney 3640.

STERILISED SUB-SOIL for Casing Mushroom Beds; delivered in 10-15 ton tip up loads to any part of the Country. Particulars: F. A. SMITH, Homeleaze, Staunton Lane, Whitchurch, Bristol. Tel.: Whit. 2465.

FOR SALE as going concern. Small Mushroom Farm, 6,000 Sq. ft. Three Zone System, Purpose-built. Ample space for expansion. Attractive house, main electricity, water. New Aga cooker. Box No. 1 .

MUSHROOM GROWER, experienced both in administrative and Technical side, seeks post on a mushroom farm, U.K. or overseas. Box No.2 .

MUSHROOMS LOVE SHIRLEY

The biggest crops of the finest quality mushrooms result from the use of Shirley Nutrients. We are also distributors of Vulcan Electric Fumigators for Pest Control and Scientific Instruments to aid the grower.

HIGH FERTILITY AT LOW COST

SHIRLEY ORGANICS Limited

VICARAGE WHARF · BATTERSEA · LONDON S.W.11

M-W.92

Published by the Mushroom Growers' Association, Agriculture House, 25-31 Knightsbridge, London, S.W. 1
and printed by W. S. Maney & Son Ltd., Russell Street, Leeds 1.